

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No. : 7,414,823
Application No. : 10/709,889
Issue Date : August 19, 2008
Inventor(s) : Manabu Hashikura, et al.
Docket No. : 039.0043
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Office of Patent Publication
ATTN: Certificate of Correction Branch
P.O. Box 1450
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Request for Expedited Issuance of Certificate of Correction **Pursuant to 37 C.F.R. § 1.322**

To the Corrections Branch Officer:

In the above-identified patent, Patentee requests that a Certificate of Correction be issued.

The text of Patentee's requested correction is submitted on the accompanying Certificate of Correction form, PTO/SB/44.

It is respectfully submitted that the requested corrections are of errors of consequence to a correct understanding of the present patent.

Furthermore, it is respectfully asserted that the requested corrections are of errors attributable solely to the Office. This assertion is believed to be unequivocally supported by the attached documentation, which is a set of pages from U.S. Pat. App. Pub. No. 2007/0095291 A9, a republication of App. No. 10/709,889, the application that issued as the patent in which the instant request for correction is being made.

App. No. 10/709,889 was republished—at Applicant's request, which is of record—as Pat. App. Pub. No. 2007/0095291 A9 because the Office's original pre-grant publication of this application contained numerous instances of garbled text, which were artifacts of the Office's earliest version of its EFS. On receiving the submitted instant application, that version of the EFS garbled certain characters in the text of the specification.

The attached set of pages from U.S. Pat. App. Pub. No. 2007/0095291 A9 clearly indicates that the garbled text was corrected. Nevertheless, in printing the present patent, the Office apparently used the original, garbled-text-containing version of the specification.

Applicant was not aware that having the Publishing Division correct the garbled text in its published version of the specification for the instant application would *not* lead to the Office's using that version to print the present patent. Moreover, it must be wondered whether being so aware would have meant that Applicant would have to have submitted amendments to the specification in a paper before the Office, separate and in addition to having the Publishing Division correct the garbled text in its published version. If so, then that would have placed a double burden on Applicant in order to have corrected errors that were attributable solely to the Office.

Accordingly, as the present request is only for correction of Office, not Applicant, mistakes, and as the accompanying documentation should unequivocally demonstrate that the mistakes are the Office's alone, expedited issuance of a Certificate of Correction is earnestly requested.

Respectfully submitted,

December 4, 2008

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within 500 μm and that the microroughness be 3 μm (Ra), because this enables the processed object to be heated uniformly and the temperature distribution in the front side of the processed object be brought to within $\pm 1.0\%$.

[0026] The ceramic-metal composite is advantageously 200 or more in diameter because that size allows the holder to handle large-scale semiconductor wafers and LCD glass, and more prominently brings out the effectiveness of the present invention. Furthermore, the composite thickness desirably is made 50 mm or less, because making the thickness 50 mm or less enables rapid heat-up and cool-down, and improves the temperature uniformity of the retaining face.

[0027] In situations in which a holder of the present invention is employed once a vacuum is drawn in the interior of the device in which it is set up, in order to keep the pump-down time from dragging out due to the issuance of gas from the holder, the water absorption ratio of the ceramic-metal composite preferably is 0.03% or less. If the water absorption ratio exceeds 0.03% the time required for pump down will be prolonged, lowering the service-ability ratio of the facility and worsening production efficiency.

[0028] In situations in which the ceramic susceptor utilized underneath the ceramic-metal composite is of an electroconductive ceramic, an electrode may be attached to the susceptor to have the ceramic itself generate heat. In cases in which the ceramic is insulative, the ceramic susceptor may be one in which a resistive heating element circuit 3 as illustrated in FIG. 1A is embedded into the ceramic, or the resistive heating element circuit 3 may be formed on the face 5, as indicated in FIG. 1B, of the susceptor on the side opposite the face on which the ceramic-metal composite 1 is placed. In cases as in FIG. 1B in which the resistive heating element circuit is formed on the surface, an insulative coating preferably is spread over the resistive heating element circuit in order to protect it and to prevent it from deteriorating.

[0029] As far as the ceramic material of the susceptor is concerned, from the perspective of heat resistance desirably the material is at least one among the ceramics Al_2O_3 , AlN, SiC, BN, Si_3N_4 and sialon (silicon aluminum oxynitride). AlN and SiC are particularly preferable since either excels in thermal conductivity and corrosion resistance—AlN being especially preferable on account of its outstanding resistance to corrosion.

[0030] It is desirable that at least one constituent selected from W, Mo, Pt, Pd, Ag, Ni and Cr be the principal component of the substance for resistive heating element. From the perspective of heat resistance it is preferable that the chief component be at least one constituent selected from W and Mo, with W being particularly preferable since it has a high melting point. Likewise, from the perspective of corrosion resistance it is preferable that the chief component be at least one constituent selected from Pt, Pd, Ag, Ni and Cr, with Pt and Pd being particularly preferable inasmuch as they excel in resistance to corrosion.

[0031] Furnishing a ceramic-metal composite atop a ceramic susceptor of this sort renders a holder for use in semi-conductor or liquid-crystal manufacturing devices that is superior in temperature uniformity and resistance to thermal shock, and with which the incidence of contami-

nants and particulates is negligible. A ceramic susceptor atop which a ceramic-metal composite has simply been set will function as a holder of the present invention.

[0032] Nevertheless, should a gap be present in between the ceramic susceptor and the ceramic-metal composite, the heat generated in the susceptor would not be transferred effectively to the ceramic-metal composite. Given that possibility, it is desirable that the ceramic susceptor be mechanically coupled to the ceramic-metal composite. While for the mechanical coupling screws are convenient, utilizing spring clips or a snug-fitting configuration is also possible. If spring clips are used, preferably they are made of a ceramic whose spring constant at high temperature is not liable to decrease. The ceramic susceptor and the ceramic-metal composite can also be chemically bonded by matching their thermal expansion coefficients. Bonding the ceramic-metal composite and the ceramic susceptor improves the adherence between them, which upgrades the heat transfer and therefore contributes to enhanced temperature uniformity.

[0033] A holder of a configuration as above in which a ceramic-metal composite is furnished atop a ceramic susceptor may be installed directly on the interior of the chamber 20 (FIG. 2) of a semiconductor or liquid-crystal manufacturing device. Nevertheless, since the heat generated by the ceramic susceptor is conveyed to the chamber if the holder is installed directly on the chamber interior—which can compromise the thermal efficiency and, with the chamber being heated excessively, can put the device out of commission—the holder preferably is provided with a support part.

[0034] The support part may support at least a portion of either the ceramic-metal composite or the ceramic susceptor, or may support at least a portion of both. Specific single examples of the support part 6 are illustrated in FIG. 2 through FIG. 7. As depicted in FIG. 2, the ceramic-metal composite 1 is supported on the support part 6 and set up in the chamber 20 interior. A power-supplying electrode 7 and a thermocouple 8 are installed inside the support part 6. The support part 6 may be hermetically sealed into the chamber 20 via an O-ring 9 as indicated in FIGS. 2-4; furthermore, it may be anchored with bolts or the like.

[0035] The temperature of the area of the support part that is in contact with the semiconductor or liquid-crystal manufacturing device desirably is lower than the temperature of the ceramic susceptor. The support part and the ceramic-metal composite or the ceramic susceptor do not necessarily have to be fixed together; the ceramic-metal composite or susceptor may be simply set atop the support part. Anchoring them is, however, to be preferred in order to heighten the reliability of the support.

[0036] Mechanical compression by means of screws, pressure insertion, crimping, implanting, spring clipping, or elastic boards can be utilized as an anchoring method.

[0037] Particularly in situations in which corrosive gases are employed, in order to prevent components such as the power-supplying electrode 7 and thermocouple 8 installed within the support part from corroding due to the corrosive gases, the support part and the ceramic-metal composite or ceramic susceptor desirably are hermetically sealed. Utilizing a technique such as localized solid-state welding, glass bonding, brazing, snug-fitting, diffusion bonding, friction

welding, and fusion welding as a hermetic sealing method will improve the reliability of the gastightness of the seal. Utilizing a localized solid-state welding, glass bonding, brazing, snug-fitting, or diffusion bonding technique is especially advantageous because it can make the gastightness of the joints 1.0×10^{-9} Pa·m³/s or less.

[0038] In making a gastight seal, the closer the thermal expansion coefficient of the support part, and the thermal expansion coefficient of the ceramic-metal composite or the ceramic susceptor are the better; substances whose difference in thermal expansion coefficient is 6×10^{-6} or less are preferable.

[0039] If the difference in thermal expansion coefficient exceeds 6×10^{-6} , structural damage such as cracks can occur in the vicinity of the joint between the support part and the ceramic-metal composite or ceramic susceptor; even if cracks do not occur during joining, in the course of being repeatedly used the joint is subjected to heat cycling, which can produce fractures and cracks. In an instance in which the ceramic-metal composite is Al-AlN, for example, the optimal support part substance is AlN, but ceramics such as silicon nitride and silicon carbide, as well as mullite may be employed.

[0040] Again, in applications in which corrosive gases are employed, the fact that the ceramic-metal composite and the support part, and the joint between them, will be exposed to the corrosive gases means a likelihood of their corroding. In order to prevent such corrosion, as represented in FIG. 6 a coating 10 excelling in erosion resistance against corrosive gases preferably is coated over at least the processed-object retaining face of the holder. Preferable as coating materials are: Si, SiO₂, SiC, AlN, diamond-like carbon (DLC), diamond, sapphire (Al₂O₃), aluminum fluoride, and graphite.

[0041] Alternatively, the ceramic-metal composite 1 and ceramic susceptor 2 may be covered, as illustrated in FIG. 7, by a member 6 that is highly anti-erosive against corrosive gases. For a member of this sort, Si, SiO₂, SiC, AlN, sapphire (Al₂O₃), aluminum fluoride, and graphite can be utilized; other than these, vitreous carbon can also be used.

[0042] As suggested earlier, inasmuch as a ceramic-metal composite of the present invention is electroconductive, the ceramic-metal composite can be utilized as an electrode. For example, rendering the composite an RF (high-frequency) electrode for generating plasma eliminates the need for providing an RF electrode separate from the resistive heating element inside the ceramic matrix, which therefore contributes to reducing the cost of the holder. Another advantage is that in applications in which the ceramic-metal composite is made an electrode, there will be no restrictions on the mounting position for the power-supply electrode, which therefore increases the degrees of freedom for the device design. What is more, in applications having the support part detailed above, rendering the support part a ceramic-metal composite also, and providing a power-supplying terminal adjacent the end portion of the support part along the chamber eliminates the need for providing a power-supplying lead and therefore makes cost-reduced design possible.

[0043] As noted previously, a holder of the present invention can be incorporated into a semiconductor manufacturing device, wherein semiconductor wafers can be processed.

Since the temperature in the wafer-retaining face of a holder of the present invention is uniform, the wafer temperature distribution also will be more uniform than is conventional, which contributes to achieving stabilized characteristics in terms of the films formed, the heating processes, etc.

[0044] As also noted previously, a holder of the present invention can be incorporated into a liquid-crystal manufacturing device, wherein LCD glass can be processed. Since the temperature in the LCD-glass retaining face of a holder of the present invention is uniform, the temperature distribution in the front side of the LCD glass also will be more uniform than is conventional, which contributes to achieving stabilized characteristics in terms of the films formed, the heating processes, etc.

EMBODIMENTS

Embodiment One

[0045] Commercially available ceramic-metal composites of 400 mm diameter, 10 mm thickness and made of Al—Al₂O₃ were readied. The processed-object retaining faces of the ceramic-metal composites were polished to finish the retaining face to a planarity of 0.03 mm and a microroughness of 0.7 μm (Ra). The water absorption ratio of the ceramic-metal composites was 0.00%. The Young's modulus, thermal expansion coefficient (α), and thermal conductivity (κ) of the composites are set forth in Table I.

[0046] In addition, ceramic susceptors made of Al₂O₃, AlN, and SiC were prepared. By creating a heat-generating patterned circuit made of molybdenum on each of sintered ceramic pieces, laminating a separate sintered ceramic piece onto each of those, and bonding the laminate together using a hot press, ceramic susceptors into which a resistive heating element is embedded were produced. The ceramic susceptors were finished to an outer diameter of 350 mm, and a thickness of 10 mm.

[0047] It should be noted that also by a method in which green sheets of each of the ceramics just noted are created, a heat-generating patterned circuit is formed onto each green sheet using a molybdenum paste, and thereafter another green sheet is laminated onto and sintered together with each of those, ceramic susceptors into which a resistive heating element is embedded can produced.

[0048] The thermal expansion coefficient (α), and thermal conductivity (κ) of each of the ceramic susceptors are set forth in Table II.

[0049] These ceramic susceptors 2 were fixed to the above-described ceramic-metal composites 1 utilizing screws (not illustrated) made of ceramic. In addition, respective support parts 6 as illustrated in FIG. 3, made from the same material as the ceramic susceptors, were glass-bonded to the ceramic-metal composites. The holders and support parts thus prepared were anchored with bolts to the interior of the chamber 20 of a semiconductor manufacturing device. A hermetical sealed between the bottom face of the support parts and the chamber was formed utilizing O-rings.

[0050] After creating setups in this way, a vacuum was drawn on the chamber interior. Pump-down was for a 5-minute interval until 1.9 Pa (0.01 torr) was reached. While pump-down was underway, furthermore, argon was flowed in, the chamber interior was reduced in pressure to 13.3 kPa (100 torr), and 200 V of power was supplied to the above-described resistive heating elements to heat the retaining side of the holders to 250° C.

[0051] The temperature uniformity of the retaining face was measured using a wafer-surface temperature gauge. In addition, thermal cycling tests were done in which heating up/cooling down the holders between room temperature and 350° C. was repeated 500 times. The temperature-uniformity measurement results, and in the thermal cycling tests in each of which 10 holders were used—the count of holders with which there were problems such as incidents of cracking or particulates are set forth in Table I.

TABLE I

No.	Ceramic-metal composite			Heater substance	Temp.	
	Young's modulus (GPa)	α ($\times 10^{-6}/^{\circ}\text{C.}$)	κ (W/mK)		uniformity \pm (%)	Cycling test
1	230	7.9	102	Al ₂ O ₃	0.2	0
2	230	7.9	102	AlN	0.1	0
3	230	7.9	102	SiC	0.1	0
4	210	12.0	54	Al ₂ O ₃	1.20	2
5	210	12.0	54	AlN	0.80	3
6	210	12.0	54	SiC	0.70	3

[0052]

TABLE II

Heater substance	α ($\times 10^{-6}/^{\circ}\text{C.}$)	κ (W/mK)
Al ₂ O ₃	7.8	29
AlN	4.6	165
SiC	4.0	179

[0053] It will be understood from Table I that in the cases in which the Al—Al₂O₃ composite having a thermal expansion coefficient of $7.9 \times 10^{-6}/^{\circ}\text{C.}$ was utilized, the temperature uniformity was within $\pm 0.5\%$, and among the ten holders run through the thermal cycling tests there were no occurrences of cracking or particulates in any of the ten. On the other hand, it will be appreciated that in the cases in which the Al—Al₂O₃ composite having a thermal expansion coefficient of $12 \times 10^{-6}/^{\circ}\text{C.}$ was utilized, the temperature uniformity was outside of $\pm 0.5\%$ —depending on the heater material, it was beyond $\pm 1.0\%$. Furthermore, in each cycling test cracking occurred in 2-3 holders among the ten in these cases.

Embodiment Two

[0054] Apart from making the ceramic-metal composite Al—AlN, holders like those of Embodiment 1 were fabricated, and the same evaluations as in Embodiment 1 were made. The results are set forth in Table III. Here, the pump-down time was the same 5-minute interval as in Embodiment 1.

TABLE III

No.	Ceramic-metal composite			Heater substance	Temp.	
	Young's modulus (GPa)	α ($\times 10^{-6}/^{\circ}\text{C.}$)	κ (W/mK)		uniformity \pm (%)	Cycling test
7	210	7.5	176	Al ₂ O ₃	0.2	0
8	210	7.5	176	AlN	0.1	0
9	210	7.5	176	SiC	0.1	0

Embodiment Three

[0055] Apart from making the ceramic-metal composite Al—SiC, holders like those of Embodiment 1 were fabricated, and the same evaluations as in Embodiment 1 were made. The results are set forth in Table IV. Here, the pump-down time was the same 5-minute interval as in Embodiment 1. For comparison, furthermore, a holder in which instead of a ceramic-metal composite an isolated Al₂O₃ ceramic was used (No. 20), one in which an AlN ceramic was used (No. 21), and one in which an SiC ceramic was used (No. 22) were prepared, and the results of evaluating these are additionally set forth in Table IV.

TABLE IV

No.	Ceramic-metal composite			Heater substance	Temp.	
	Young's modulus (GPa)	α ($\times 10^{-6}/^{\circ}\text{C.}$)	κ (W/mK)		uniformity \pm (%)	Cycling test
10	200	6.2	159	Al ₂ O ₃	0.2	0
11	200	6.2	159	AlN	0.2	0
12	200	6.2	159	SiC	0.1	0
13	195	7.1	162	AlN	0.3	0
14	180	7.6	163	AlN	0.2	0
15	175	8.0	165	AlN	0.2	0
16	150	10.0	162	AlN	0.2	5
17	125	14.4	162	AlN	0.2	7
18	105	16.2	164	AlN	0.2	7
19	95	17.6	162	AlN	0.2	9
20	390	7.8	29	Al ₂ O ₃	0.9	4
21	314	4.6	165	AlN	0.3	5
22	410	4.0	180	SiC	0.2	6

[0056] The following will be understood from Tables I through IV. The holders in which a ceramic-metal composite was utilized, with there being no occurrences of fractures or the like in the cycling test, excelled over the isolated ceramic holders (Nos. 20-22) in resistance to thermal shock. No problems occurred in the cycling test with those holders whose Young's modulus was 300 GPa or less. Utilizing a ceramic-metal composite having a thermal conductivity of 100 W/mK or more made it possible to bring the temperature uniformity to within $\pm 0.5\%$. Nevertheless, if the thermal expansion coefficient of the ceramic-metal composite is at a remove from the thermal expansion coefficient of the ceramic susceptor, inasmuch as during high temperature excessive heat stress is produced in the joint between the ceramic-metal composite and the ceramic susceptor, the probability of damage in the cycling test will be high.

Embodiment Four

[0057] Apart from having the material of the ceramic-metal composites be Si—Al₂O₃, Si—AlN, and Si—SiC, respectively, and from making the resistive heating element tungsten, holders like those of Embodiment 1 were fabricated, and the same evaluations as in Embodiment 1 were made. The temperature uniformity was with the temperature being 800° C., and the cycling test was 500 heat-up/cool-down cycles between room temperature and 800° C. The results are set forth in Table V. Here, the holders were finished to a planarity of 0.03 μm and a microroughness of 0.7 μm (Ra). The pump-down time to 1.3 Pa with every one of the materials was the same 5-minute interval as in Embodiment 1. In addition, in Table VI the Young's modu-

lus, thermal expansion coefficient (α), and thermal conductivity (κ) of the composites utilized are set forth.

TABLE V

No.	Ceramic-metal composite	Heater substance	Temp. uniformity \pm (%)	Cycling test
23	Si—Al ₂ O ₃	Al ₂ O ₃	0.3	0
24	Si—Al ₂ O ₃	AlN	0.2	0
25	Si—Al ₂ O ₃	SiC	0.2	0
26	Si—AlN	Al ₂ O ₃	0.2	0
27	Si—AlN	AlN	0.1	0
28	Si—AlN	SiC	0.1	0
29	Si—SiC	Al ₂ O ₃	0.2	0
30	Si—SiC	AlN	0.1	0
31	Si—SiC	SiC	0.1	0

[0058]

TABLE VI

Heater substance	Young's modulus (GPa)	$\alpha (\times 10^{-6}/^{\circ}\text{C})$	$\kappa (\text{W/mK})$
Si—Al ₂ O ₃	265	7.0	106
Si—AlN	270	4.5	167
Si—SiC	280	2.8	175

Embodiment Five

[0059] Holders were created by readying the same 400-mm diameter, 10-mm thickness Si—SiC composites as in Embodiment 4, and combining ceramic susceptors together with the holders likewise as with Embodiment 1. After support parts in the manner of Embodiment 1 were joined to the holders, a thin SiO₂ film 10, as represented in FIG. 6, of some 30 μm thickness was thermal-spray coated over the entire surface of the holder and support part. The holders underwent the same temperature-uniformity evaluation and thermal cycling test at 800° C. as in Embodiment 4. The results are set forth in Table VII.

TABLE VII

No.	Ceramic-metal composite	Heater substance	Temp. uniformity \pm (%)	Cycling test
32	Si—SiC	Al ₂ O ₃	0.2	0
33	Si—SiC	AlN	0.1	0
34	Si—SiC	SiC	0.1	0

Embodiment Six

[0060] Holders of the form shown in FIG. 3 were prepared in the same way as in Embodiment 5, apart from having the size of the Si—SiC composites be the diameters entered in Table VII, and 20 mm thickness, and from making the outer diameters of the ceramic susceptors each 50 mm smaller than the respective diameters of the Si—SiC composites. The same temperature-uniformity evaluation and thermal cycling test at 800° C. as in Embodiment 5 were performed. The results are set forth in Table VII. Here, the time required for pump-down to 1.3 Pa was a 5-minute interval.

TABLE VIII

No.	Si—SiC dia. (mm)	Heater substance	Temp. uniformity \pm (%)	Cycling test
35	200	Al ₂ O ₃	0.1	0
36	200	AlN	0.1	0
37	200	SiC	0.1	0
38	150	AlN	<0.1	0
39	100	AlN	<0.1	0

[0061] It will be appreciated that with diameter of the holder being smaller the temperature uniformity improves.

Embodiment Seven

[0062] The same Si—SiC composites as well as AlN ceramic susceptors as those utilized in Embodiment 4 were readied. The planarity and microroughness of the retaining faces of the Si—SiC composites were finished to the values set forth in Table IX. These Si—SiC composites and AlN ceramic susceptors were utilized to structure, in the same way as in Embodiment 5, the net form in FIG. 6. These holders underwent the same temperature-uniformity evaluation and thermal cycling test at 800° C. as in Embodiment 5. The results are set forth in Table IX. Here, wise as with Embodiment 1 pump-down reached 1.3 Pa (0.01 torr) in a 5-minute interval.

TABLE IX

No.	Holder surface planarity (mm)	Holder surface microroughness Ra (μm)	Temp. uniformity \pm (%)	Cycling test
33	0.03	0.7	0.1	0
40	0.10	0.7	0.2	0
41	0.50	0.7	0.3	0
42	0.60	0.7	0.9	0
43	0.03	1.0	0.3	0
44	0.03	3.0	0.4	0
45	0.03	5.0	1.0	0

[0063] It will be understood from Table IX that bringing the planarity of the retaining face to within 0.5 mm enables the retaining-face temperature uniformity to be brought within $\pm 0.5\%$, making the microroughness of the retaining face 3 μm allows the retaining-face temperature formity to be brought within $\pm 1.0\%$.

Embodiment Eight

[0064] Si—SiC composites of 40 mm diameter, 10 mm thickness and, by varying the molding precision, 0.01% and 0.03% water absorption ratio were obtained. Holders of the FIG. 6 configuration likewise as with Embodiment 5 were created utilizing these Si—SiC composites together with AlN ceramic susceptors. The same temperature-uniformity evaluation and thermal cycling test at 800° C. as in Embodiment 5 were performed.

[0065] The results were that with a sample (No. 46) in which the Si—SiC composite of 0.01% water absorption ratio was utilized, 30 minutes were necessary to draw a vacuum down to 1.3 Pa; with that of 0.03% water absorption ratio (No. 47), 1 hour was required. It was evident that the time required for pump-down grew longer because the larger

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

Page 1 of 1

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INVENTOR(S) : Manabu Hashikura, Hirohiko Nakata, Akira Kuibira, and Masuhiro Natsuhara

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 4, lines 41 and 42, "within 500 \square m and that the microroughness be 3 \square m (Ra)" should read --within 500 μ m and that the microroughness be 3 μ m (Ra)--.

Column 7, line 41, "0.7 \square m (Ra)" should read --0.7 μ m (Ra)--.

Column 7, lines 43 and 44, and lines 62 and 63, as well as column 10, lines 10 and 11, "thermal expansion coefficient (\square), and thermal conductivity (\square)," each occurrence, should read --thermal expansion coefficient (α), and thermal conductivity (κ)--.

Column 8, Table II, (line 41), " $\square(\times 10^{-6}/^{\circ}\text{C})$ " should read -- $\alpha(\times 10^{-6}/^{\circ}\text{C})$ --, and " $\square(\text{W/mK})$ " should read -- $\kappa(\text{W/mK})$ --.

Column 10, line 7, "0.7 \square m (Ra)" should read --0.7 μ m (Ra)--; Table VI, (line 29), " $\square(\times 10^{-6}/^{\circ}\text{C})$ " should read -- $\alpha(\times 10^{-6}/^{\circ}\text{C})$ --, and " $\square(\text{W/mK})$ " should read -- $\kappa(\text{W/mK})$ --; line 43, "30 \square m" should read --30 μ m--.

Column 11, Table IX, (line 35), "Ra (\square m)" should read --Ra (μ m)--; line 47 "3 \square m" should read --3 μ m--.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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